Incorporating the Human Dimension in Headwater Management--An Organizing Framework and Six Principles

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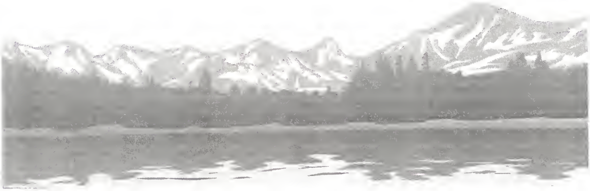

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Introduction

Setting watershed management goals involves human as well as biophysical considerations. Who determines goals and policies for managing watersheds and how are they determined? These are necessary social and institutional questions--the human element of watershed management. The purpose of this paper is to introduce the human dimension, or social-institutional aspects, of headwater management and to present an organizing framework for incorporating this dimension into land management decisions.

Role and Importance of Headwaters

Headwater areas are landscapes held in high esteem. They have value because they are primary sources of high-quality water and other renewable natural resources. Increasingly, headwater areas are valued for their scenic and outdoor recreation amenities, wildlife habitat, rare plants and animals, gene pools, carbon sinks, nutrient cycling, and air quality.

Sustainable headwater management is the management of the soil, vegetation, water, and associated amenity resources within headwater areas in such a way as to not diminish the value of those resources for present and future generations. Value is the key word in that definition, because values are implicit in the concepts of property, natural resources, and environmental quality. Personal values, which reflect diverse individual perspectives, often give rise to strong emotions and conflicts over land uses. Political and institutional boundaries rarely coincide with natural features, adding to the conflicts over land and natural resources.

Headwater management policies and goals are difficult to establish, particularly where there are conflicting interests or multiple landowners in large watersheds. Even where a watershed consists entirely of public lands, there are likely to be conflicts over land uses and desired future ecological conditions.

The Human Dimension: Social, Cultural, and Institutional Elements

Watershed management has traditionally dwelled on the biophysical aspects and ignored the human dimension. Human resources are divided into two categories: socioeconomic and cultural. Socioeconomic resources include population (a source of labor), investments (including investments in scientific research), information, and ideas. Cultural resources include beliefs, values, myths, and the organization of human activities. Watershed management objectives need to consider cultural and socioeconomic resources as well as biophysical resources.

People interact with landscapes at three different levels: physically, emotionally, and indirectly. Primary social interactions include physical activities on the landscape such as timber harvesting, livestock grazing, firewood gathering, berry or mushroom picking, hunting, fishing, camping, hiking, and various other recreational activities. Secondary activities or emotional interactions result from personal involvement with laws, regulations, policies, hearings, voting, property rights, and other institutional activities involving land and natural resources. Tertiary or indirect interactions stem from personal values, culture, heritage, beliefs, and interests.

Human social systems, which are general social structures guiding much of human behavior, are composed of three subsystems: social order (cultural identities, status, norms, beliefs, hierarchies), social cycles (temporal patterns of human activity or trends in human thought), and social institutions (Machlis et al., 1997). Social cycles significantly affect the distribution and use of natural resources. Social order involves the nature and control of interactions between individuals and groups. Institutions are organized social systems created to find solutions to social challenges or needs.

The three types of human-landscape interactions may be orthogonally related to the three social sub-systems. The resulting matrix, shown in Figure 1, represents the human dimension that should be considered in land management issues. Although not all nine cells of this organizing framework may be applicable to headwaters, the framework is useful for analyzing the social-institutional facets of a watershed management issue.

A Case Example: The Beaver Brook Watershed

The Beaver Brook watershed is located in the central Rocky Mountains west of Denver, Colorado. A tributary to Clear Creek, Beaver Brook drains an area of approximately 11 square miles, ranging in elevation from 7,800 to 11,400 feet. A 5500-acre portion of the Beaver Brook watershed, including almost 2,000 acres of federal land, was purchased by the City of Golden in the early 1900s for use as a municipal watershed. About 400 acres at the upper end of the watershed are national forest lands within the Arapaho National Forest. The watershed is mostly forested with occasional open meadows. The area is important habitat for elk, mule deer, fox, black bear, mountain lion, grouse, and wild turkey. Some logging occurred within the watershed in the early 1900s. Small thinning operations, designed to benefit elk and mule deer habitat, are conducted annually under the supervision of the Colorado State Forest Service. An underground natural gas pipeline runs through the watershed. The watershed also lies at the heart of a 17-mile preservation corridor that begins in the Mount Evans Wilderness Area, runs through 11 miles of national forest, and ends at a county open space park.

The City of Golden leases its property to the Colorado Division of Wildlife for use as a state wildlife management unit. The watershed is closed to motor vehicles but is open to the

public for hiking and hunting. Golden ceased using the watershed as a municipal water supply in the 1940's. Two small reservoirs, 12 miles of pipeline, two miles of easements, 580 water taps, and the associated water rights were sold to the Lookout Mountain Water District in 1988. The Beaver Brook watershed is still used as a municipal watershed, serving about 2,000 people.

Golden is negotiating to purchase the Guanella Gravel Pit adjacent to Clear Creek near Empire, Colorado and plans to construct a new water storage reservoir. It wants to use the proceeds from the sale of its Beaver Brook property to develop the water storage project and to pay for water rights it recently purchased from another municipality. Golden considers the property to be worth more than $20M. However, the Clear Creek County Commissioners recently voted to zone 89 percent of the Beaver Brook watershed as natural resource/ preservation-conservation land, thereby precluding Golden from subdividing the property into residential estates. Golden subsequently filed suit against the Commissioners, citing a "takings" and claiming that the zoning reduced the value of the City's property.

Because the Beaver Brook watershed was managed as a municipal watershed for many years, it remained relatively pristine with few land disturbances. A few small residential subdivisions exist along the western boundary and at the lower end of the Watershed. Trailheads were established by the Division of Wildlife and the watershed has become a well-used hiking and hunting area. The Mountain Area Land Trust (MALT) offered the City of Golden $6M for its land with the intention of preserving the watershed as open space, protecting the significant wildlife, recreation, and water quality values.

Clearly, the Beaver Brook watershed holds values for many groups and individuals. The biophysical values, such as wildlife habitat and water quality, are fairly well-understood. Figure 2 demonstrates how the organizing framework may be used to better understand the human dimension of this watershed. The matrix contains nine cells that can be used to characterize the socio-institutional issues of the Beaver Brook Watershed. Three of the cells are explicated as examples.

The Beaver Brook watershed story is not unique in the West. As communities expand, they require additional water supplies and headwater areas are likely sources of high-quality water. Protecting headwater areas to meet community water needs usually involves land-use conflicts. An understanding of both the biophysical and human dimensions of these conflicts is necessary for effective headwater management.

Six Principles of Headwater Management

When the organizing framework (Figures 1 and 2) is applied to headwater areas, especially where land-use conflicts exist, six management principles emerge. They are aimed at land managers and those responsible for making land-use policies at the watershed level.

Management Policies and Goals Are Linked to Societal Values

Desired future ecological conditions, environmental restoration goals, or headwater management policies, all relate to societal values and should be determined collectively by everyone who has a stake in the outcomes. Therefore, headwater management policies and goals should be closely tied to societal values.

Management Decisions Rely on Credible Science and Integrated Efforts

An interdisciplinary, systems approach is needed to understand ecological processes in headwater areas. Reductionism is of limited scientific value without a synthesis effort to integrate the various disciplines and sciences. People respect credible science and assume that management decisions will be based on the best available scientific information.

Data Are Collected at Multiple Spatial and Broad Temporal Scales

Watersheds are part of larger natural and social systems. Headwater management requires relatively large spatial scales and long temporal scales. Even more important is the ability to "zoom" from one scale to another to better understand ecological processes. The same is true of temporal scale, which should encompass the past, present and projected future ecological conditions.

Information is Shared Openly and Inclusively

An institution, like any organization, has the responsibility to keep its information streams well-stocked and running freely. With advances in automated information systems, information may be widely-shared among groups and individuals. Knowledge and information provide a systemic means of identifying the root causes of resource allocation conflicts and lead to empowerment of citizens to solve those problems. In order for information to be useful in natural resource decision making, it must be timely, unbiased and objective, and scientifically credible. People should be able to distinguish between scientifically-credible knowledge and anecdotal information.

Policies are Made Collaboratively

Collaboration begins with open and honest communication between all parties. It involves community learning, meaning those who participate in decision making must be willing to invest the time to learn about resource management issues and to listen to all sides of an issue. Collaborative decision making about land uses and natural resources must be based on credible science and scientific knowledge. A participatory, consensus approach to making decisions and policies means that every interested person is able to participate in the decision process.

Institutions for Managing Watersheds Must be Adaptable

Since social values and needs change dynamically with time, institutions must have the ability to adapt to those changes (Cortner et al., 1996). Institutions must also be willing to learn and to freely exchange information outside their boundaries as new knowledge becomes available. Adaptable institutions create flexible laws, policies, and management practices. People want institutions that are flexible instead of rigid and adaptable instead of stable (Wheatley 1994).

Institutional Options for Headwater Management

How should headwater areas like the Beaver Brook Watershed, characterized by complex land-use issues and mixed land ownership, be managed? A solution analysis for considering institutional options for headwater management should address three key concerns. First, there must be a good fit between the land-use setting and the operative administrative structure. The complexity of the setting, which is a function of the number and predictability of the variables, will dictate the complexity of the administrative structure. In complex settings, pressures on the agencies require that they be accountable to a broader set of constituents, adapt more flexible administrative forms, be more responsive to uncertainty, and learn to deal concurrently with problems of representation and expert judgment (Boschken 1982).

Second, a solution set must recognize that administrative behavior is related to organizational structure and that administrative behavior impacts the representation of interests. Institutions must be close to their constituencies in order to be effective. MacDonnell and Bates (1993) advocate the use of local, geographically-based organizations suited to the needs of their citizens and empowered to influence future resource management decisions that affect them. Flexible institutions, located close to their geographic area of responsibility, with open communication styles and participatory decisionmaking processes are well suited to serving the needs of their constituents. Institutional structures that emphasize social interactions are needed. Finally, the solution set should be grounded in the six principles of headwater management.

Institutions must also represent and listen to all constituents, understand the physical landscape and the social dynamics of the community, find and allocate financial resources, act as an unbiased depository of information and widely share that information, implement policies with flexibility to change, and provide open forums for resolving conflicts. Effective institutions possess and articulate a long-term view of land and people; balance sustainable development with environmental protection; integrate science and management; practice inclusive, participatory policy making; and equitably distribute goods and services.

Generally speaking, citizen-initiated cooperative watershed planning efforts and watershed

councils are a response to institutional deficiencies. They arise because landowners and government entities fail to resolve land-use and resource conflicts within traditional institutional frameworks. A cooperative watershed approach facilitates coordination among government and private entities with resource management or regulatory authority in the watershed (Natural Resources Law Center, 1995). Watershed councils are recommended especially for watersheds characterized by complex land ownership patterns.

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SOCIAL SUBSYSTEMS

HUMAN-LANDSCAPE INTERACTIONS		SOCIAL ORDER	SOCIAL CYCLES	SOCIAL INSTITUTIONS
	PRIMARY			
	SECONDARY			
	TERTIARY			

Figure 1. An organizing framework for the human element in headwater management.

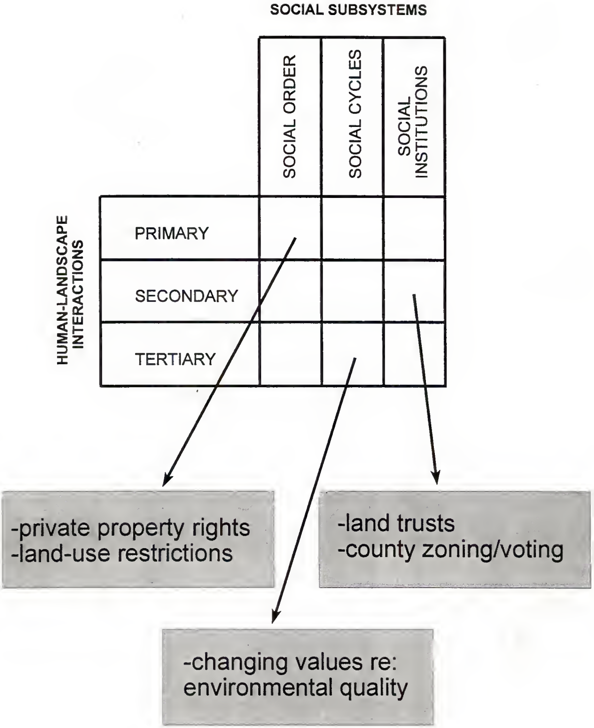

Figure 2. The framework applied to the Beaver Brook Watershed issue.